



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

*cu*

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/530,588	05/05/2000	KIMIHIRO MATSUSE	2312-0866-2P	6686
22850	7590	01/28/2004	EXAMINER	
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			QUACH, TUAN N	
			ART UNIT	PAPER NUMBER
			2814	

DATE MAILED: 01/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/530,588

Applicant(s)

MATSUSE ET AL.

Examiner

Tuan Quach

Art Unit

2814

-- Th MAILING DATE of this communication appears on th cover sheet with th correspondenc address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 18 December 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 112-118, 120-124, 126-128 and 131-137 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 112-118, 120-124, 126-128 and 131-137 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. §§ 119 and 120

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

**DETAILED ACTION**

This application presents a claim for subject matter not originally claimed or embraced in the statement of the invention. The various subject matter delineated in the claims, e.g., claims 112, 121, 126, 131, e.g., processing vessel, shutting off the supplying of the gases, removing by purging, etc., "evacuating the processing vessel" in claims 112, 121, 126, 131 line 4, "completely removing the process from the processing vessel by purging . . ." in these claims penultimate step, are not originally claimed or embraced in the statement of the invention. A supplemental oath or declaration is required under 37 CFR 1.67. The new oath or declaration must properly identify the application of which it is to form a part, preferably by application number and filing date in the body of the oath or declaration. See MPEP §§ 602.01 and 602.02.

The abstract of the disclosure is objected to because it fails to describe the invention now claimed. Correction is required. See MPEP § 608.01(b).

Claims 120 and 137 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The "film containing tungsten nitrided" in claim 120 and "the nitride film containing tungsten" in these claims lack antecedent basis.

Claims 120 and 137 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed,

Art Unit: 2814

had possession of the claimed invention. There is no support from the specification for a process to form a film containing tungsten made of  $WN_x$  or  $WSi_xN_y$  by supplying  $WF_6$  and  $SiH_4$  in the context of claim 112. Note that the amended feature, e.g., "nitrided" does not overcome this rejection since such lacks antecedent basis and support in based claim, e.g., line 5 of claim 112. There is no support for tungsten nitrided film or nitride film containing tungsten by supplying the above process gases. Applicant is requested to point out the supporting portions from the original disclosure.

Claims 112-118, 120-124, 126-128, 131-137 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. There is no support from the specification for the features delineated above with regard to the The various subject matter delineated in the claims, e.g., claims 112, 121, 126, 131, e.g., processing vessel, shutting off the supplying of the gases, removing by purging, etc., "evacuating the processing vessel" in claims 112, 121, 126, 131 line 4, "completely removing the process from the processing vessel by purging . . ." in these claims penultimate step, "completely removing the process gas from the processing vessel by supplying a purging gas into the processing vessel while evacuating the processing vessel" are not supported by the original disclosure. Applicant is requested to point out the supporting portions from the original disclosure.

Art Unit: 2814

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a). For convenience, "et al." are omitted.

Claims 112-118, 121-124, 126-128, 131, 133-136 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chow taken with Park.

Chow teaches introducing tungsten hexafluoride, silane and hydrogen to the reactor to form the tungsten containing layer, after forming the tungsten containing layer, stopping the flow of the gases, evacuating the reaction chamber, introducing nitrogen containing gas to form nitride containing tungsten, thus any remaining process gas would have been purged by the introduction of the nitrogen containing gas and as Chow does not require any process gas, e.g., column 3 lines 2-5. The use of plasma and the use of argon for backfill flushing prior to introducing nitrogen containing gas for forming the nitride is also taught. The removal of process gas prior to subsequent

Art Unit: 2814

nitridation thus would have been contemplated and obvious. See column 2 line 27 to column 3 line 56. The maintaining of a predetermined pressure or evacuating the vessel (insofar as such is supported or disclosed in the original disclosure, see e.g., page 15 lines 21-23) would have been obvious and inherent to obtain the operating low pressure as delineated at column 2 lines 38-47; alternatively, the maintaining of a low pressure to minimize influence of any remaining materials in the reaction chamber prior to injecting reaction gas is conventional and advantageous as delineated in Park, column 2 lines 54-57 and would correspond to the evacuation of the vessel. The purging of the  $WF_6$  to the extent desired, including all of this gas or completely removal would have been obvious as argon for backfill flushing is contemplated and as the chamber is evacuated and as such gas is not needed for the subsequent processing. The use of conventional purging gas such as nitrogen is well known in the art and as such would have been obvious. Regarding the use of same apparatus or different apparatus or a another apparatus, e.g., claim 114, such corresponds to two obvious alternatives and as such would have been obvious. The selection of appropriate conventional nitrogen containing gases including  $N_2$ ,  $NH_3$ , MMH, is well within the purview of one skilled in the art, and conventional as alternative nitrogen sources and as acknowledged in the admitted prior art, instant specification page 19 lines 14-15. Alternatively, official notice is given hereby regarding such conventional alternative nitrogen sources. Disilane or dichlorosilane correspond to well known alternatives to silane and as admitted in the instant specification page 15 lines 7-8. The selection and optimization of appropriate parameters including temperatures, pressures, flow rates of

Art Unit: 2814

the forming gases and of the gas containing nitrogen, would have been a matter of routine experimentation and would have been further obvious given the teachings of Chow at column 2 lines 39-44.

Claims 115, 123, 127, 134 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chow taken with Park as applied to claims 112-118, 121-124, 126-128, 131, 133-136 above, and further in view of Hatano.

Regarding the alternative sources of nitrogen, in addition to the reasons delineated above, the use of MMH as nitrogen containing source would have been further conventional and obvious as evidenced by Hatano, column 4 lines 9-63 for nitridation.

Claims 117, 135, 136 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chow taken with Park as applied to claims 112-118, 121-124, 126-128, 131, 133-136 above, and further in view of Buyn.

Regarding the tungsten containing layer including tungsten silicide, such would have been obvious as documented by Buyn, column 3 line 67 to column 4 line 3 wherein the tungsten containing layer including tungsten silicide where silicon source, e.g.,  $\text{SiH}_2\text{Cl}_2$  and  $\text{SiH}_4$  is employed and wherein such silicide material is known to be advantageous as conductor having improved characteristics including low resistivity.

Claims 120 and 137 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chow taken with Park as applied to claims 112-118, 121-124, 126-128, 131, 133-136 above, and further in view of Fleming.

The formation of conventional tungsten nitride or tungsten silicon nitride having desired barrier characteristics would have been conventional and obvious and is further evidenced in Park, column 2 lines 48-52; by Fleming, the abstract, column 4 lines 29 to column 5 line 67, and as such would have been obvious.

Claims 122 and 132 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chow taken with Park as applied to claims 112-118, 121-124, 126-128, 131, 133-136 above, and further in view of Yelverton.

Regarding the use of nitrogen as the purging gas, such would have been obvious in view of the teaching of Yelverton, column 2 line 14 wherein the use of nitrogen as the preferable inert purge gas is taught.

Applicant's arguments filed December 18, 2003 have been fully considered but they are not persuasive.

Initially regarding the newly amended features, see the new grounds of rejections above. In addition, applicant argues that Chow employs N<sub>2</sub> while applicant recites NH<sub>3</sub>. This however overlooks the teaching in the instant specification, e.g., page 19 line 14 wherein such alternative gases containing nitrogen is well known. Applicant further argues that a better film quality and barrier is obtained by using NH<sub>3</sub>. This has not been sufficiently characterized as to what constitutes "better" and further contradicts the original disclosure wherein it is taught that "needless to say NH<sub>3</sub> or N<sub>2</sub> may be used . . . ". The argument further fails to take into consideration the teachings of the prior art. Regarding the alternative sources of nitrogen, in addition to the reasons delineated above, the use of MMH as nitrogen containing source would have been further



Art Unit: 2814

conventional and obvious as evidenced by Hatano, column 4 lines 9-63 for nitridation. regard to Park, applicant argues that Park does not teach purging gas into the processing vessel to completely removing process gas. This however fails to consider the teachings of Chow as delineated above. Park column 2 lines 54-57 nonetheless evidences that the maintaining of a low pressure as has been argued by applicant in the claims that were previously presented (e.g., claim 112 line 4 regarding "maintaining a predetermined pressure") corresponding to the process disclosed in the original disclosure would have been obvious wherein such introduction of gases following the development of a vacuum of desired pressure is conventional and advantageous to minimize the influence of the remaining materials in the reaction chamber.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Quach whose telephone number (571)272-1717. The examiner can normally be reached on M - F from 9 to 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor Wael Fahmy can be reached on (571)272-1705. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571)272-1562.



Tuan Quach  
Primary Examiner